AR5002 Atheros Radio Test Reference Guide

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Revision History

Revision	Description of Changes
April 2003	Initial release.
June 2003	Updated to describe EAR support.

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Contents

3 ART Extensions For Command Line Testing

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List of Figures

DO NOT COPY

List of Tables

Preface

This document is intended to provide a description of the installation and operation of the Atheros Radio Test (ART) application.

ART is a manufacturing and radio evaluation tool that can be used with the AR5002 family of devices.

About this Document

The document consists of the following chapters:

Chapter 1   **Overview**—Gives a brief description of ART and its current feature set.

Chapter 2   **Atheros Radio Test Reference Guide**—Describes the installation and operational procedures.

Chapter 3   **ART Extensions For Command Line Testing**—Describes the extensions that have been added to enable tests to be run from the command line.

Audience

This document is intended for users of ART who will be performing radio evaluation or setting up a manufacturing flow with the Atheros AR5002 devices.

Additional Resources

Atheros Reference Design hardware, software, and documentation contain proprietary information of Atheros Communications, Inc., and are provided under a license agreement containing restrictions on use and disclosure, and are also protected by copyright law. Reverse engineering of this hardware, software, or documentation is prohibited.

The following resources should be referenced regarding topics that are not addressed in this document:

■ *AR2112 Radio-on-a-Chip for 2.4 GHz Wireless LANs data sheet*

■ *AR5112 Radio-on-a-Chip for 5 GHz and 2.4 GHz Wireless LANs data sheet*

■ *AR5212 Multiprotocol MAC/Baseband Processor for 5 GHz and 2.4 GHz Wireless LANs data sheet*

■ *AR5312 Multiprotocol MAC/Baseband Processor for 5 GHz and 2.4 GHz Wireless LANs data sheet*

■ *AR5001/AR5002 Sample Manufacturing Test Flow*

■ *AR5001/AR5002 16K EEPROM Device Configuration Guide*

■ *AR5001/AR5002 Manufacturing Library Reference*

1

Overview

The Atheros Radio Test (ART) is a tool to be used for radio evaluation and manufacturing test. It provides the ability to perform various transmission tests, receive and link tests and also provides the ability to calibrate and test adapters during a manufacturing flow.

NOTE: All the information related to EEPROM for Reference Designs based on the AR5212 will also, unless specified otherwise, apply to the Flash memory in AR5002AP Access Point Reference Designs based on the AR5312 or the AR2312.

The current release, ART V4.0, supports the following features:

- Supports AR5002 client adapters and AR5002 based APs. (Refer to "ART Operation" on page 2-6 and "Using ART with an AR5002 AP" on page 2-8.)

- Switching between 5 GHz and 2.4 GHz OFDM modes (refer to "Toggle Mode (o)" on page 2-21).

- Continuous transmission tests (refer to "Continuous Transmit Options (c)" on page 2-22).

- Receive tests (refer to "Continuous RF Receive Options (r)" on page 2-26).

- Link tests (refer to "Link Test (l)" on page 2-27).

- Throughput tests (refer to "Throughput Menu (T)" on page 2-28).

- EEPROM programming (refer to "EEPROM Function (p)" on page 2-29).

- Manufacturing tests (refer to "Manufacturing Test & Calibration (m)" on page 2-30).

- Logging (refer to "Enable Logging (g)" on page 2-31).

- A utilities menu for register access and other miscellaneous utilities (refer to "Utility Menu (u)" on page 2-31).

This version of ART only supports AR5002 and AR5001+ adapters. Older versions of ART should be used for other adapters. Table 1-1 summarizes which adapters are supported by which versions of ART.

Table 1-1. **Adapters and EEPROM Versions Supported by ART Calibration**

ART Version	EEPROM Version Supported by Calibration	Adapter Types Supported
4.0	4.0	AR5002, AR5001+
2.5	3.4	AR5001+
2.4	3.3	AR5001
2.3	3.3	AR5001
2.2	3.2	AR5001
2.1	3.2	AR5001

2

Atheros Radio Test Reference Guide

The Atheros Radio Test (ART) utility provides tests that can be run to evaluate the performance and functionality of Atheros chipsets. Its purpose is to serve as both an evaluation tool and also a manufacturing test tool. This chapter describes how to install and run ART.

Installation

> **NOTE:** In versions 2.2 and later of ART, the low level driver changed to an Atheros Native Windows Driver (ANWI), therefore the installation procedure for ART has changed. Care should be taken to remove the older driver used by previous versions of ART, before installing the new driver.

Take the following steps to install ART:

1. Copy files from the art\bin release directory, to a directory on the system that will contain the AR5002 Atheros adapter. It is best to install ART before installing the adapter.

2. Copy, or refer to the art driver release directory, art_driver\bin. There are two directories here, one containing the Windows 2000 driver and another containing the Windows XP driver. These directories contain the driver and batch files to install the driver for either operating systems.

If an installation of the old Windows 2000 ART driver (prior to version 2.2) is resident, please remove it first by running the batch file **art_driver\bin\2000\uninst_old_drv.bat**.

This batch file will:

■ Remove **windrvr.sys**, **wdusb.sys** and **dkkernel.sys** from the directory **\winnt\system32\drivers**

■ Remove **DKar500x.inf** from **\winnt\inf**.

Prior to installing the new driver, any instances of the driver "Atheros AR5001 Diagnostics Kernel Driver" should be removed from the Windows Device manager.

To install the driver for ART versions 2.2 and beyond run the batch file **art_driver\bin\2000\inst_new_drv_2000.bat** for an installation on Windows 2000 or **art_driver\bin\xp\inst_new_drv_xp.bat** for an installation on Windows XP respectively.

These batch files will:

■ Copy **anwiwdm.sys** to the directory **C:\winnt\system32\drivers for Windows 2000, or to C:\windows\system32\drivers** for Windows XP.

■ Copy **anwi.inf** to **\winnt\inf**.

NOTE: The batch files assumes that Windows 2000 is installed in **C:\winnt** and Windows XP is installed in **C:\windows**. If this is not where the OS is installed, change the batch file to copy to the **system32\drivers** and **inf OS** directories.

A scan for new hardware changes within Windows should now install an instance of "Atheros AR5002 Anwi Diagnostics Kernel Driver", as shown in Figure 2-1
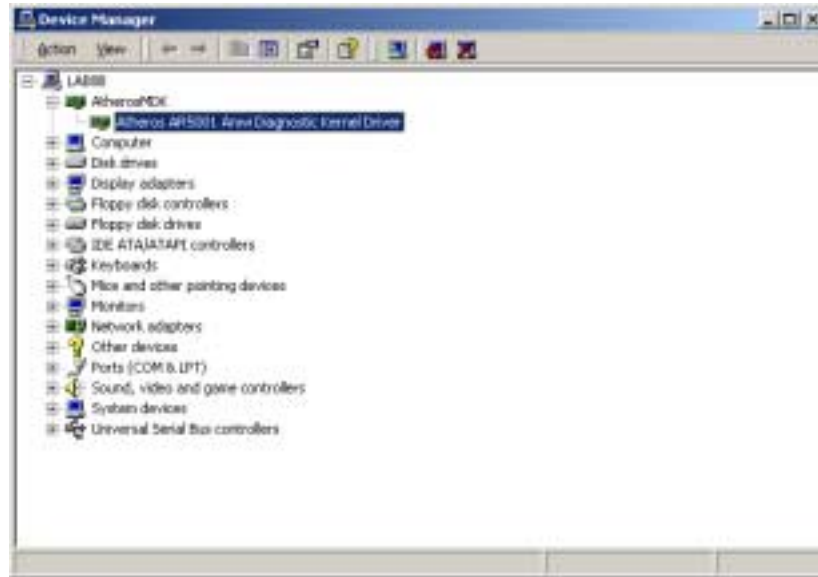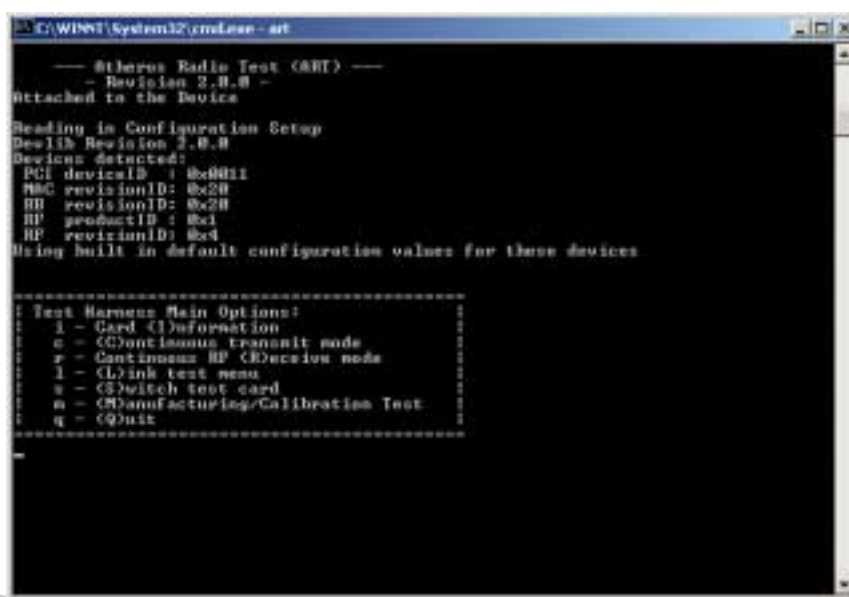
Figure 2-1. **Successful Installation of ANWI driver in Device Manager**

ART Operation

The current version of ART will only operate either within Windows 2000 or Windows XP environments and runs as a console mode application. ART tests will run with AR5001+ and AR5002 adapters including AR5002 APs. Client adapters should be part of the system running ART. To run with an AP, commands are sent from a Windows host machine over Ethernet to the AP.

To start the ART utility for client cards, enter ART at the command prompt of the system containing the client adapter. Figure 2-2 shows the initial ART startup menu.

Figure 2-2. **ART Initial Screen**

See "Using ART with an AR5002 AP" on page 2-8 for details on how to run on an AP. On startup (or whenever a Reference Design card is replaced), ART accesses the adapter or AP and reads device version, base address, interrupt and MAC address information. It also performs a simple interrupt and register test on the devices. The main menu is displayed if all this is successful. Failure to display the main menu could indicate an incorrect installation of the software or hardware or it could be due to a faulty adapter. Verify software and adapter installation to rule out installation problems.

NOTE: ART checks to see whether the adapter has already been calibrated. If so, it will automatically load the EEPROM settings on startup.

ART Command Line Options

The current version of ART supports four optional command line arguments (as well as the command line test arguments described in "ART Extensions For Command Line Testing" on page 3-1): a remote command line option, a card-identification command line option, EEPROM programming option, and an instance specification when dealing with multiple radios on one system.

```
C:\art> art \remote=1.2.3.4 \id=1022 \prog \instance=1
```

where 1.2.3.4 is the IP address of the remote stations, the ID identifies what .eep file should be loaded for this card, \prog will program locations 0 through 0xbe of the EEPROM and \instance specifies which on of multiple cards in one system should ART execute on.

See "ART Remote Command Line Option" on page 2-11 for more details on the \remote option.

See "Running ART with Multiple Radios" on page 2-15 for more details on the \instance option.

See "Determining the .eep File to Use" on page 2-19 for more details on the \id option.

Using ART with an AR5002 AP

This section describes using ART with an Atheros AR5002 AP.

ART Setup for AP

For an AP, the ART utility executes on the host PC and it communicates with the ART client running on the AP. So it is necessary to install the ART utility and the low level drivers on the host PC. Refer to the Installation section on how to install the ART utility and the low level drivers. Figure 2-3 shows the setup required to run ART for an AP.
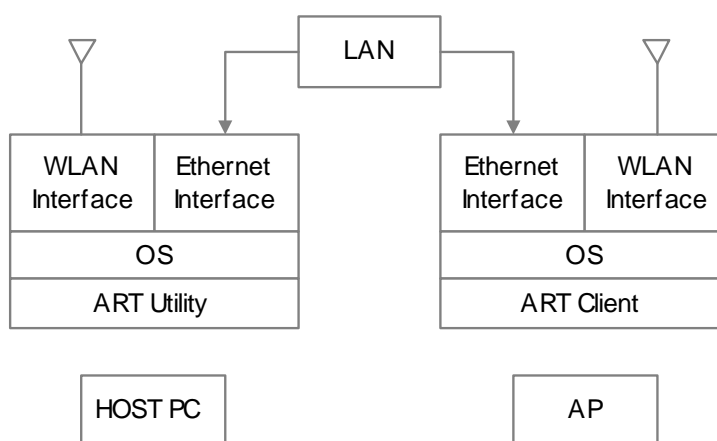
Figure 2-3. **ART Setup for AP**

A client application (ART client) executes on the AP, which waits for the commands from the ART running on the PC. This client application will be started automatically when the AP is booted.

NOTE: AP in the document actually refers to Atheros AR5002AP Access Point Reference Designs.

Configuring the IP Address for the AP

The ART client communicates with the ART running on the host PC using TCP/IP sockets. It is necessary to configure the IP address of the AP before using ART. The IP address is stored in the AP's flash memory. The OS kernel reads this IP address and configures its Ethernet interface during boot time. A default IP address (192.168.1.254) will be stored initially in the AP's flash memory. It may be necessary to change this default address, to the LANs network address.

To change this default IP address, follow these steps:

1. Create a network whose network address is 192.168.1.0 and connect the AP to that network.

2. In any PC connected to that network, open a DOS console window and type the following:

    ```
    C:\> telnet 192.168.1.254
    ```

This will start a command shell on the AP and the command prompt (->) will appear on the console. If the new IP address is "a.b.c.d", type the following at the command prompt. (Change only the inet on Ethernet field. Hostname can refer to the IP address of the AP or an IP name associated with the IP address.)

```
->bootChange
'.' = clear field; '-' = go to previous field;  ^D = quit
boot device                     : tffs:0
processor number                : 0
hostname                        :
filename                        : /fl/APIMG1
inet on ethernet (e)            : 192.168.1.20 a.b.c.d
inet on backplane (b)           :
host inet (h)                   :
gateway inet(g)                 : <gateway address if required>
user (u)                        :
ftp password(pw)(blank = use rsh) :
flags (f)                       : 0x0
target name (tn)                :
startup script (s)              : factory
other (o)                       : ae
value = 0 = 0x0
->reboot
```

The AP will now reboot with the new IP address. This may hang the DOS console window. It takes around 15 seconds to reboot the AP. One should be able to communicate with the AP using this new IP address. If incorrect inputs are given, restore the factory default settings by using the external switch (press the switch for about 4 seconds) and configure the IP address again.

Configuring AP's WLAN and Ethernet MAC Addresses

Sometimes it may be necessary to configure the WLAN or Ethernet MAC addresses, if it conflicts with the existing network interface addresses. Open a telnet connection to the AP and type the command **bdChange** at the shell prompt. Comments written inside curly braces, won't appear on the display.

```
-> bdChange
Update board data (enter to keep, ^D to finish):
name [Atheros AR5002AP default]
HW watchdog [n]
memcap valid [n]
cpufreq valid [y] {enter y to get the CPU frequency}
cpufreq [80000000] {
sysfreq valid [y] {enter y to get the system bus frequency}
sysfreq [80000000]
wlan mac address [00:03:7f:fe:00:12]: <new wlan mac address>
enet0 mac address [00:03:7f:fe:00:13]: <new enet0 mac address>
enet1 mac address [ff:ff:ff:ff:ff:ff]:
major [1]:
minor [0]:
pciid [0011]:
wlan enabled [y]:
enet0 enabled [y]:
enet1 enabled [n]:
external serial clock enabled [n]: {internal serial clock always}
uart0 (console) enabled [y]: {high-speed UART which supports DMA}
sysled enabled [y]
sysled gpio [7] {System LED is connected to GPIO 7}
factory reset enabled [y]
factory reset gpio [6]

name:    Atheros AR5002AP default
magic:   35333131
rev:     1
major:   1
minor:   0
pciid:   0011
wlan:    yes 00:03:7f:fe:00:12 {new wlan address should appear here}
enet0:   yes 00:03:7f:fe:00:13 {new enet0 address should appear here}
enet1:   no  ff:ff:ff:ff:ff:ff
uart0:   yes
uart1:   no
sysled:  yes, gpio 7
factory: yes, gpio 6
serclk:  internal
cpufreq: calculated 80000000 Hz
sysfreq: calculated 80000000 Hz
memcap:  disabled
watchdg: disabled
done.  Reboot to activate
value = 0 = 0x0
->reboot
```

ART Remote Command Line Option

The remote command line option is used to instruct the host PC ART, to send the commands to the ART client running on the remote AP. It is always necessary to use this command line option for an AP.

To start the ART utility for the AP, type the following at the DOS command prompt:

```
C:\> art \remote=a.b.c.d
```

where: a.b.c.d is the AP's IP address.

Example Run

Follow these steps to setup ART for an AP:

1. Configure the AP's IP address, WLAN MAC address and Ethernet MAC address.

2. Connect the AP to the configured LAN network.

3. Reboot the AP.

4. Ping the AP to ensure that is up and running.

5. In any PC connected to the same network:

   a. Open a telnet connection to the AP on a DOS console window (A). The shell prompt (->) should appear on the DOS window.

   b. Open another DOS console window (B) and start the ART utility.

   The example shown below is for an AP with IP Address 10.10.12.34:

   C:\>art \remote=10.10.12.34.

Figure 2-4 shows the DOS console window that will appear when the PC Host ART utility is started. The error and debug messages printed by the ART client will appear on the telnet DOS window. Figure 2-5 shows the telnet DOS window that will appear, when the ART utility is started on the host.

Figure 2-4. **Initial ART Screen on Host PC**

Figure 2-5. **ART Client Messages on Startup**

Updating New ART Client Executable Image

Whenever you update the ART client executable, it is necessary to update the executable image in the AP's flash memory. This can be done in two ways:

- Using flash.bin binary image

- Using APIMG1 executable image

Using flash.bin Binary Image

The binary file flash.bin contains a snapshot of the entire 4 MB flash memory present in the AP. This image can be programmed into the flash memory device using the flash programmer. The programmed flash memory device can then be mounted on the AP. This method should be used when the flash memory device is programmed for the first time.

Using APIMG1 Executable Image

APIMG1 is a binary file which contains the ART client image in the ELF executable format. This method can be used when the flash memory is already programmed and the new ART client image has to be updated in the flash memory.

This method uses the ftp protocol to download the image. Use any desired ftp server software. In any PC connected to the same network as the AP, perform the following steps:

1. Start the ftp server in the PC.

2. Open a telnet connection to the AP on a DOS console window (A). The shell prompt (->) should appear on the DOS window.

3. Type the following at the shell prompt:

```
->ftpdownload
hostname: <PC's IP address>
Username: anonymous
Password: guest
Remote File: APIMG1 <or path to the directory where the file APIMG1 is
stored>
Local File: APIMG1
```

This will download the new APIMG1 image from the PC to the AP's flash memory. Downloading the new image will overwrite the previous image from the AP flash memory. Wait until the download completes before rebooting the AP. Sometimes the ftpdownload process fails with "remote read error" or "local write error". Repeat the above step until the download succeeds. Reboot the AP to load the new ART client image from the flash.

Updating Bootrom

New bootrom can be updated from the vxworks command shell. To do this first download the bootrom image (bootrom.bin) from the PC to the AP using ftp download. Type the following at the vxworks shell prompt:

```
-> bootrom "bootrom.bin"
Bootrom overwriteen with file bootrom.bin

->reboot
```

Testing Ethernet Interface(s)

ART client running on the AP and the ART utility running on the host communicates by using TCP/IP sockets through the Ethernet 0 interface. Successful communication between the two indicates the Ethernet 0 interface is working fine.

For boards having two Ethernet interfaces, it is necessary to test the second Ethernet interface. Though there are two Ethernet interfaces, the ART client currently doesn't support using both Ethernet interfaces at the same time. It is necessary to enable and assign a unique MAC address to the second interface before it can be used. Refer to section "Configuring AP's WLAN and Ethernet MAC Addresses" on page 2-10 on how to enable and assign a MAC address to the Ethernet interface.

To test the Ethernet interface(s) in the AP, follow these steps:

1. Connect the Ethernet cable to the first Ethernet interface.

2. Ping the AP using its assigned IP address. Ping should be able to receive a reply from the AP. Successful ping replies indicates the first Ethernet interface is working fine.

3. For boards having two Ethernet interfaces:

    a. Remove the Ethernet cable from the first interface and insert it in the second interface.

    b. Ping the AP using its assigned IP address. Ping should be able to receive a reply from the AP. Successful ping replies indicates the second Ethernet interface is working fine.

Creating Flash Image

The flashCopy command can be used to take a snapshot of the entire flash memory content as a binary file in the host PC. This binary file can be used to program the other flash memory devices before they are mounted on the board. This command uses the FTP protocol to download the flash image. It is necessary to run the ftp server in the host PC. This command takes the flash memory size (in kilobytes) as its argument. To copy the 4MB flash image as flash.bin in the host PC, do the following at the vxworks command prompt.

```
->flashCopy 4096
hostname:10.10.12.34
Username:<valid user name>
Password:
Remote File:flash.bin
#####################################
#####################################
.
done
```

Running ART with Multiple Radios

The Atheros AR5002 AP-2X access point contains two radios, one supporting 802.11a and the other supporting 802.11b/g. The dual-slot development platforms (PB22 and PB32) also provide the ability to support two Atheros radio adapters. ART provides the ability to communicate with one or other of these radios by using the \instance command line option. The first radio is always instance=1 (which is the ART default), while the second radio is instance=2. In order to run the two radios simultaneously, two sessions of ART should be run, one with the command line option \instance=1 and the other with the command line option \instance=2.

When running with the AR5002AP-2X access point, if no instance is specified on the command line, ART will run in a special mode. It will automatically switch radios between instance 1 and instance 2 when changing mode. For example it will communicate with radio 1 when 11a mode is selected and will communicate with radio 2 when 11g, or 11b is selected. Note however that in order to run both radios simultaneously, \instance=1 and instance=2 must be specified on the command line. When running on the AR5002 AP, it is the user's responsibility to ensure that only 11a mode is used for instance 1 and 11g or 11b mode is used with instance 2.

External Configuration Files

There are four external text files that can be used with ART to control its operation:-artsetup.txt, calsetup.txt, ar5002*.eep files, and calTrgtPwr files. Artsetup.txt allows you to specify the initial operation environment, for example which channel transmission or reception should start on, whether or not to enable Atheros Turbo Mode™ and whether to load the calibration information from the EEPROM. The ar5002*.eep files contain adapter specific information, one for each of the supported AR5002 adapters, detailing the optimal configuration settings for the cards operation and calibration. The calsetup.txt and calTrgtPwr files contain adapter specific and generic information used during adapter calibration. The calTrgtPwr, calsetup.txt and one section of the ar5002*.eep files are described in the *AR5001/AR5002 Sample Manufacturing Test Flow* document. The other section of the ar5002*.eep files and artsetup.txt file are described here.

Environment Configuration File: artsetup.txt

The **artsetup.txt** file allows you to control the following options:

```
#initial configuration options
5_CHANNEL_MHZ = 5260     #The initial 5GHz channel in MHz
2_4_CHANNEL_MHZ = 2412   #The initial 2.4GHz channel in MHz
#ALL_2G_CHANNELS = 1


#eeprom configuration
EEPROM_LOAD_OVERRIDE = 0          #set to 1 override loading of eeprom
                                   calibration info
TURBO = 0               #set to 1 to enable turbo mode
MODE = 0

#register configuration files, comment out line touse defaults
#LOG_FILE = artout.log
LOGGING = 0
LOAD_EAR = 1


RATE_MASK = 0X7fff

#BLANK_EEP_ID = 0x1031 #which subsytem ID to use for lookup if blank eeprom
DUT_CARD_SSID = 0x1031


#              subsystemID filename
CFG_TABLE =    0x1025      ar5001x2_cb21g.eep
CFG_TABLE =    0x2025      ar5001x2_mb21g.eep
CFG_TABLE =    0x1026      ar5001x2_cb22ag.eep
CFG_TABLE =    0x2026      ar5001x2_mb22ag.eep
CFG_TABLE =    0x1027      ar5001x2_cb22g.eep
CFG_TABLE =    0x2027      ar5001x2_mb22g.eep
CFG_TABLE =    0x1028      ar5001a2_cb21.eep
CFG_TABLE =    0x2028      ar5001a2_mb23.eep
CFG_TABLE =    0x1031      ar5002x_cb32ag.eep
CFG_TABLE =    0x2031      ar5002x_mb32ag.eep
CFG_TABLE =    0x1030      ar5002g_cb31g.eep
CFG_TABLE =    0x2030      ar5002g_mb31g.eep
CFG_TABLE =    0xA032      ar5002ap_ap30ag.eep
CFG_TABLE =    0xA033      ar5002ap_ap31g.eep
```

The channel, turbo, logging and mode settings take effect at the initial execution of ART. If any of these are changed within the application, then the new value will take effect for the remainder of the ART session.

The RATE_MASK setting controls which rates will send packets when ART runs a link test. One bit is used per rate. Table 2-1 shows the rate mask mapping for the various modes. As many rates as required can be combined. If non-applicable masks are set, they are ignored for the modes which do not use them.

Table 2-1. **RATE_MASK Encoding Per Rate**

Mask	Rate Encoding by Mode			
	802.11a	**802.11b**	**802.11g**	**OFDM@2.4**
0x01	6 Mbps	1 Mbps Long	6 Mbps	6 Mbps
0x02	9 Mbps	N/A	9 Mbps	9 Mbps
0x04	12 Mbps	2 Mbps Long	12 Mbps	12 Mbps
0x08	18 Mbps	2 Mbps Short	18 Mbps	18 Mbps
0x10	24 Mbps	5.5 Mbps Long	24 Mbps	24 Mbps
0x20	36 Mbps	5.5 Mbps Short	36 Mbps	36 Mbps
0x40	48 Mbps	11 Mbps Long	48 Mbps	48 Mbps
0x80	54 Mbps	11 Mbps Short	54 Mbps	54 Mbps
0x100	N/A	N/A	1 Mbps Long	N/A
0x200	N/A	N/A	2 Mbps Long	N/A
0x400	N/A	N/A	2 Mbps Short	N/A
0x800	N/A	N/A	5.5 Mbps Long	N/A
0x1000	N/A	N/A	5.5 Mbps Short	N/A
0x2000	N/A	N/A	11 Mbps Long	N/A
0x4000	N/A	N/A	11 Mbps Short	N/A

If an adapter has been calibrated with power tables then ART will automatically load and run with the EEPROM information. Set the flag EEPROM_LOAD_OVERRIDE to cancel this automatic load of EEPROM.

If the LOAD_EAR flag is set then ART will load the EEPROM Added Registers (EAR) section from the EEPROM. When running in this mode, ART will load an older set of configuration values, then apply the EAR registers to create an up to date configuration. When LOAD_EAR is not set, then the latest set of configuration parameters is loaded. Whether loading EAR of not, the resulting configuration should be the same. The intention of LOAD_EAR is to test out the EAR. Refer to the *AR5001/AR5002 16K EEPROM Configuration Guide* for a detailed description of the EAR.

The EEPROM contains the adapter specific settings needed for the adapter to perform at its optimal performance. Prior to programming the EEPROM, these settings are read from the adapter specific eep file. The CFG_TABLE setting is used to associated an adapter's subsystem ID with the appropriate eep file. Having the subsystem ID verses eep lookup table in artsetup.txt means that any adapter subsystem ID can be associated with the correct configuration settings that should be loaded in the absence of an EEPROM load. If the EEP files are resident in a different directory to the current, then the option EEP_FILE_DIR can be used to specify an alternative.

New to release 4.4, an additional, optional column has been added to the CFG_TABLE. The third column is used to specify the EAR file that should be loaded into the EEPROM during the manufacturing of that adapter type. If no EAR file is specified, then no EAR section will be written to EEPROM. Note that this file is only used during manufacturing, it is NOT used in conjunction with the LOAD_EAR flag. If the LOAD_EAR flag is set and no EAR section exists in EEPROM, then EAR will NOT be loaded.

Determining the .eep File to Use

On startup, ART will read the subsystemID from the EEPROM, then look for a match to this ID within the CFG_TABLE entries in artsetup.txt. If a match is found then the corresponding .eep file will be parsed and applied to the adapter. If a subsystem ID was read from the EEPROM but no match is found in the CFG_TABLE entries, ART will exit in error. If the EEPROM is blank, then ART requires that BLANK_EEP_ID specify the subsystem ID that should be used as the lookup for the CFG_TABLE entries. Table 2-2 lists the .eep files together with reference boards they apply to.

Table 2-2. **EEP Filenames for Atheros Reference Designs**

EEP Filename	Subsystem ID	Reference Board Description
ar5001x2_cb22ag.eep	1026	AR5001X+ 802.11a/b/g CardBus Reference Design
ar5001x2_cb22g.eep	1027	AR5001X+ 802.11b/g CardBus Basic Reference Design (11a front end depopulated)
ar5001x2_cb21g.eep	1025	AR5001X+ 802.11b/g CardBus Revised Reference design
ar5001x2_mb22ag.eep	2026	AR5001X+ 802.11a/b/g Mini PCI Reference Design
ar5001x2_mb22g.eep	2027	AR5001X+ 802.11b/g Mini PCI Basic Reference Design (11a front end depopulated)
ar5001x2_mb21g.eep	2025	AR5001X+ 802.11b/g Mini PCI Revised Reference design
ar5001a2_mb23.eep	2028	AR5001A+ 802.11a High Power Mini PCI Reference Design
ar5001a2_cb21.eep	1028	AR5001A+ 802.11a CardBus Reference Design
ar5002x_cb32ag.eep	1031	AR5002X 802.11a/b/g CardBus Reference Design
ar5002g_cb31g.eep	1030	AR5002G 802.11b/g CardBus Reference Design
ar5002x_mb32ag.eep	2031	AR5002X 802.11a/b/g Mini PCI Reference Design
ar5002g_mb31g.eep	2030	AR5002G 802.11b/g Mini PCI Reference Design
ar5002ap_ap30ag.eep	a032	AR5002AP 802.11a/b/g AP with Ethernet Router
ar5002ap_ap31g.eep	a033	AR5002AP 802.11b/g AP with Ethernet Router

The command line option \ID overrides the above mechanism. Whatever subsystem ID is given on the command line will be used as the lookup to the CFG_TABLE entries.

Specifying DUT Adapter Type to Golden Station

During manufacturing testing, the golden station needs to know what .eep file is being used by the DUT station. This is needed so that the golden station can open the correct target power file such that the manufacturing tests will stay in sync between the golden and the DUT stations. Use the DUT_CARD_SSID option on the golden machine to specify the subsystem ID that will be used to lookup the correct EEP file for the DUT.

Environment Configuration File: ar5002.eep

The ar5002.eep (and ar5001+) files contain 2 sections: an @cal_section, which contains information used by calibration, and an @config_section, which contains information for operation and calibration. This section describes the @config_section of the ar5002*.eep files. The other section of the these files is described in the *AR5001/AR5002 Sample Manufacturing Test Flow* document.

The @config_section of the files specifies the values of the registers that should be applied to a specific adapter for it to work at its optimal performance. For example the antenna control switch table, the ob, db or xpd_gain values that should be applied for that adapter. The registers specified in these files are the same register values that will be written to the EEPROM during calibration. The values will read from the eep files in the absence of an EEPROM load.

Two subsections can be present in this section of the file as shown below:

```
bb_tx_frame_to_xpaa_on          0x0e
bb_tx_end_to_xlna_on               2
#----------------------------------------------------------------
@MODE: MODE_SPECIFIC            11a    11a_turbo       11b        11g
#----------------------------------------------------------------
bb_switch_settling             0x2d       0x5a        0x23       0x2d
bb_txrxatten                   0x0d       0x0d        0x0c       0x0d
bb_pga_desired_size             -80        -80         -80        -80
bb_adc_desired_size             -32        -32         -38        -38
```

The first subsection is for registers that are not mode specific. Two columns are used, one for the name of the field and one for the value of the field. In the case of the AR5002AP, only this format is supported.

The second subsection, which is identified by the @MODE: MODE_SPECFIC tag, is for registers that change values between modes. Five columns are used, containing the field name and the values for modes 11a, 11a Turbo, 11b, and 11g as shown above. For adapters that do not support all the modes, the values for those modes not supported are ignored.

NOTE: Internally within the software, register fields are identified as mode specific or mode independent. It is important that mode specific register fields appear in the mode specific section of the EEP file and mode independent registers appear in the mode independent. It is recommended that users keep the register fields in the sections identified in the EEP files provided by Atheros.

For a description of the register fields, refer to the *AR5001/AR5002 Sample Manufacturing Test Flow* document.

ART Commands

Once **art.exe** is executed, a menu with test options will appear. To run a test, press the character key that is assigned to the test option. For example, press **c** to run the continuous transmit test.

```
=============================================
| Test Options:                             |
|   o - Toggle M(o)de                       |
|   e - Load (E)EPROM Calibration           |
|   c - (C)ontinuous transmit mode          |
|   r - Continuous (R)eceive mode           |
|   l - (L)ink test menu                    |
|   t - (T)hroughput test menu              |
|   p - EE(P)ROM function                   |
|   s - (S)witch test card                  |
|   m - (M)anufacturing test & calibration  |
|   g - Enable lo(g)ging                     |
|   u - (U)tility Menu                       |
|   q - (Q)uit                              |
=============================================
```

Toggle Mode (o)

This switches mode of operation between 5 GHz OFDM and 2.4 GHz OFDM. Once the mode is selected, transmission will occur in that mode for the remainder of the ART session, or until changed. The initial mode of operation can be controlled by the mode option in **ARTSETUP.TXT**.

Load EEPROM Calibration (e)

This menu toggles between loading from EEPROM and ignoring EEPROM values. Load from EEPROM will cause the data from the EEPROM to be loaded into the appropriate registers. In this mode the EEPROM data will overwrite the register values applied by the register configuration file it will also overwrite parameter changes (that is, PCDAC or Power) made during the ART session. When in the ignore EEPROM mode then the register file values will be apply.

NOTE: The text on this menu applies to what action would occur if the menu were selected. For example when the menu states Load EEPROM, then currently the EEPROM values are not loaded. When the menu states Ignore EEPROM, then the EEPROM values are currently loaded.

Continuous Transmit Options (c)

Continuous transmit options allow you to dynamically change the channel frequency, data rate as well as a number of radio characteristics. It also allows switching between single-carrier mode and 99, 100 percent or dynamic (FRAME), duty cycle data mode (with different data patterns such as RANDOM and PN9).

Choice of antenna and Atheros Turbo Mode™, which now toggles between turbo mode, normal speed and half rate, can also be selected. In half rate mode, the subcarrier bandwidth is cut in half, resulting in half the occupied bandwidth and data rates. The half rate mode is introduced to accommodate the 10 MHz bandwidth requirement in lower Japan band 4.9–5.15 GHz.

Toggle scramble mode provides the ability to turn off data scrambling. This is needed when estimating carrier suppression in CCK mode.

ART version 2.3 and beyond adds the ability to toggle dynamic optimization. When dynamic optimization is enabled, ART constantly looks to make chip set adjustments to provide optimum transmit performance. See "Dynamic Optimization" on page 2-25 for a detailed explanation of the dynamic optimization process.

Press ESC to return to the main Test Options menu when finished.

```
====================================================================
| Continous Transmit Options                                       |
|   p - Increase Center Frequency by 10 MHz (P inc by 100 MHz)     |
|   l - Decrease Center Frequency by 10 MHz (L dec by 100 MHz)     |
|   o - Increase Data Rate                                         |
|   k - Decrease Data Rate                                         |
|   i - Increase pcdac (I inc by 10)                               |
|   j - Decrease pcdac (J dec by 10)                               |
|   f - Increase power output by 0.5dBm (F inc by 5dBm)            |
|   c - Decrease power output by 0.5dBm (C dec by 5dBm)            |
|   u - Increase ob by 1 (w - increase b-ob)                       |
|   h - Increase db by 1 (q - increase b-db)                       |
|   v - Toggle power override (ovr)                                |
|   x - Toggle external power                                      |
|   y - Increase gainI by 1 (Y inc by 10)                          |
|   g - decrease gainI by 1 (G dec by 10)                          |
|   m - Increase rf Gain Boost                                     |
|   s - Toggle output mode (tx100 | tx99 | single carrier)         |
|   b - Toggle turbo mode                                          |
|   a - Toggle antenna                                             |
|   d - Toggle Data Pattern                                        |
|   z - Toggle Scramble mode                                       |
|   t - Increase interframe spacing slots                          |
|   r - Decrease interframe spacing slots                          |
|   9 - Toggle dynamic optimization                                |
|   4 - Increment Fixed gain                                       |
| ESC - exit                                                       |
====================================================================
```

Menu items in red are not always available and depend on the state of power override. If power override is off, then the ability to toggle external power is available, but not the ability to adjust gainI. If power override is on then the ability to change gainI is available but not external power control. The ability to increment the fixed gain is only available when dynamic optimization is inactive. Interframe spacing control is only available when in FRAME mode and enables the user to control the output duty cycle.

In addition to allowing the user to control the duty cycle, FRAME mode also differs from TX99 in that the packet size has been varied so that each of the rates all have the same transmit time per packet, that is, slow rates send a smaller packet than the faster rates.

Power Control

To obtain accurate power control within 0.5 dBm, ensure that the EEPROM calibration information has been loaded from the main menu, then use the 'c' and 'f' options from this menu. Once selected, the power value shown by the software, should be the measurable power, output by the AR5111. To gain accurate power output it is important that the EEPROM calibration information be loaded. The calibration calculates which PCDAC values will produce the desired power level, then loads these values into the 64-entry power table in the device, where each entry is a step of 0.5 dBm. The software then points to the appropriate entry in this table to set the power. Note that the maximum power output will be limited by the capabilities of the adapter.

Alternatively to manually control the power output Figure 2-6 and Figure 2-7 shows how the other RF parameters can be changed to affect the output power for the AR5111 and AR5112 respectively.

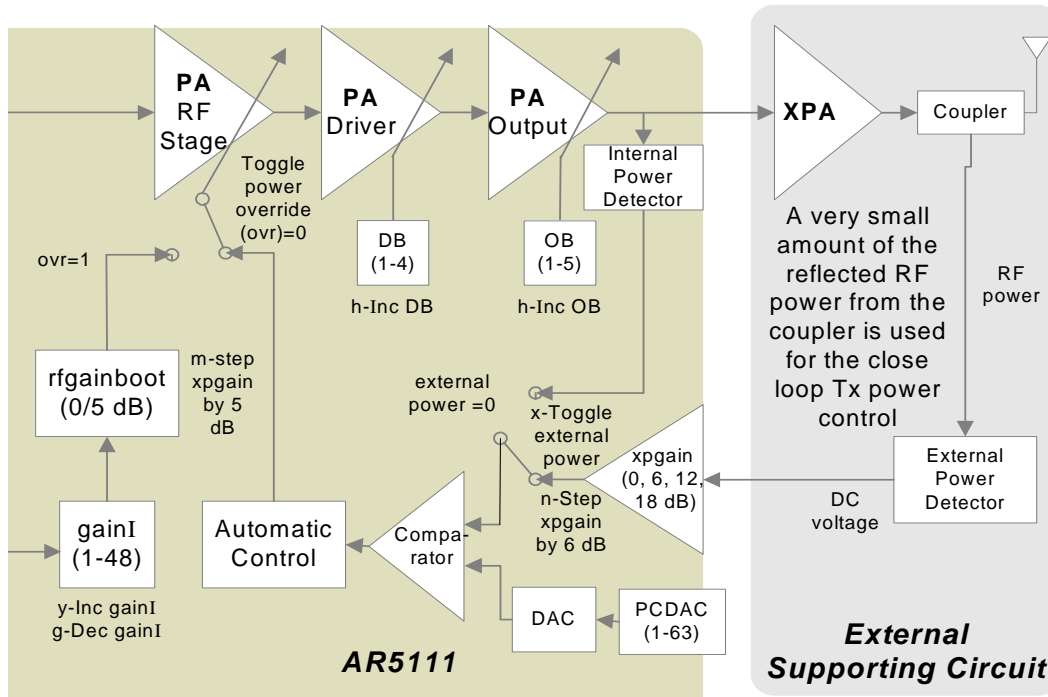*Figure 2-6.* **AR5111 Tx Power Control Diagram**
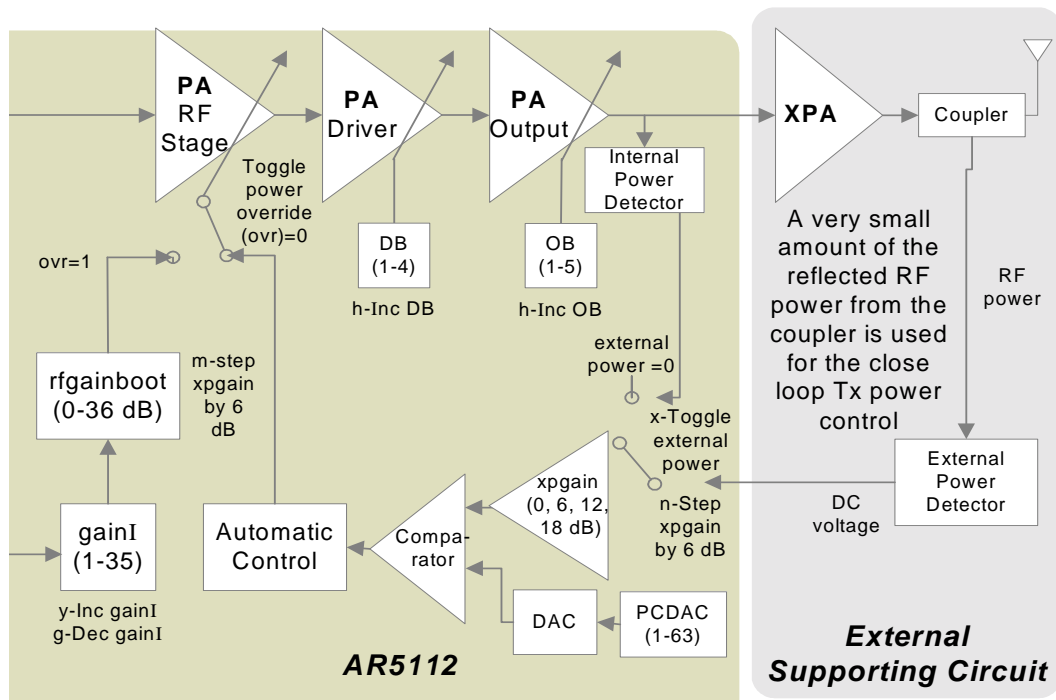
Figure 2-7. **AR5112 Tx Power Control Diagram**

Dynamic Optimization

To get the optimal performance at all rates, it is of utmost importance to be able to accurately control and maintain the target powers for various rates. There is some variable gain that is at the disposal of the "transmit power control" (TPC) state machine in Atheros chipsets and is used to control the power on a per packet basis. (The parameter "GainF" reflects the variable gain used for the last packet transmitted). It is desirable to have sufficient headroom on the higher, as well as lower end of the variable gain available to the TPC state machine so as to be able to attain the range of target powers for all rates. There are some factors that could diminish this headroom, namely, the temperature and the quality of matching between various rf stages.

As the temperature changes, the actual gain provided by various stages varies - it decreases with increasing temperature, and increases with decreasing temperature. This difference has to be compensated for by the variable gain. Similarly, poor matching also needs to be compensated for by additional gain.

Both of these effects happen on a time scale much longer than per packet. Thus, the software can periodically probe if GainF is running out of headroom (at higher or lower end) and appropriately add or remove some fixed gain in the rf chain. Dynamic optimization in ART performs just that: it has 9 sets of fixed gains available, referred to as FG0..FG8, that provide from -6dB to +6dB of fixed gain. Dynamic optimization periodically probes the GainF and selects an appropriate fixed gain (FG0..FG8) to keep the GainF within a target range of 20-35. The total range for GainF being 0-50, this ensures ample headroom in the variable gain available at all times.

This procedure is also mimicked in the driver, which probes GainF once every 60 seconds. Performing this optimization dynamically, for every card on every channel, guarantees the best performance achievable for each card and also maximizes the temperature range supported.

Continuous RF Receive Options (r)

Continuous RF receive options will put the radio into receive mode to allow for radio measurements/evaluation. The antenna, channel and amount of receive gain can be changed. Press ESC to return to the main Test Options menu when finished.

NOTE: This is not a data receive mode. Receive information will not be reflected on screen. It is intended for instrumentation measurement only.

```
=====================================================================
| Continous RF Receive Options                                      |
|   p - Increase Center Frequency by 10 MHz (P inc by 100 MHz)      |
|   l - Decrease Center Frequency by 10 MHz (L dec by 100 MHz)      |
|   i - Increase rx Gain (I inc by 10)                              |
|   j - Decrease rx Gain (J dec by 10)                              |
|   a - Toggle antenna                                              |
| ESC - exit                                                        |
=====================================================================|
```

Link Test (I)

Link test requires that two stations are both running **art.exe**. One station will transmit 100 packets for all 8 data rates (6 Mbps to 54 Mbps) and the other station will receive and display statistics such as Packet Error Rate (PER) and Received Signal Strength Indication (RSSI). Packets can either be interleaved, loop sending one packet at each rate, which is the default, or send all 100 at one rate before switching to the next rate. The antenna, center frequency, and various radio characteristics can be selected prior to or during the test. Press ESC to return to the main Test Options menu when finished.

ART has the ability to toggle dynamic optimization. When dynamic optimization is enabled, ART constantly looks to make chipset adjustments to provide optimum transmit performance.

```
==================================================================
| Link Test Mode                                                 |
|   t - Tx                                                       |
|   r - Rx                                                       |
|   p - Increase Center Frequency by 10 MHz (P inc by 100 MHz)   |
|   l - Decrease Center Frequency by 10 MHz (L inc by 100 MHz)   |
|   i - Increase pcdac (I inc by 10)                             |
|   j - Decrease pcdac (J dec by 10)                             |
|   f - Increase power output by 0.5dBm (F inc by 5dBm)          |
|   c - Decrease power output by 0.5dBm (C dec by 5dBm)          |
|   u - Increase ob by 1 (w - increase b-ob)                     |
|   h - Increase db by 1 (q - increase b-db)                     |
|   z - Toggle packet interleave                                 |
|   v - Toggle power override (ovr)                              |
|   x - Toggle external power                                    |
|   y - Increase gainI by 1 (Y inc by 10)                        |
|   g - decrease gainI by 1 (G dec by 10)                        |
|   m - Increase rf Gain Boost                                   |
|   b - Toggle turbo mode                                        |
|   a - Toggle antenna                                           |
|   d - Toggle Data Pattern                                      |
|   9 - Toggle dynamic optimization                              |
|   4 - Increment Fixed gain                                     |
| ESC - exit                                                     |
==================================================================
```

Menu items in red are not always available and depend on the state of power override. If power override is off, then the ability to toggle external power is available, but not the ability to adjust gainI. If power override is on then the ability to change gainI is available but no external power control. The ability to increment the fixed gain is only available when dynamic optimization is inactive.

Throughput Menu (T)

The throughput menu requires 2 stations to running ART. One station acts as a transmitter, the other as a receiver. Throughput is calculated on the transmit side and, when unicast packets are used, is based on the number of packets completed with the successful reception of an 802.11 ACK packet. The receive station sits in a passive receive state and only sends ACK packets back to the transmitting station. No information about the packets it receives is shown on the receive station. If the transmit station sends broadcast packets, no receive station is required. The type of packet, number of packets, packet size, and how many retries should be attempted are configured on the transmit side. Like the other ART menus, the frequency, data rate antenna and other radio characteristics can be configured on either the transmit or receive side.

ART has the ability to toggle dynamic optimization. When dynamic optimization is enabled, ART constantly looks to make chipset adjustments to provide optimum transmit performance.

```
===================================================================
| Throughput Test Mode                                            |
|   t - Tx                                                        |
|   r - Rx                                                        |
|   p - Increase Center Frequency by 10 MHz (P inc by 100 MHz)    |
|   l - Decrease Center Frequency by 10 MHz (L dec by 100 MHz)    |
|   o - Increase Data Rate                                        |
|   k - Decrease Data Rate                                        |
|   s - Toggle packet size (500 | 1000 | 1500 | 2000)             |
|   e - Increase HW retries                                       |
|   d - Decrease HW retries                                       |
|   z - Toggle number of packets (5000 | 10000)                   |
|   i - Increase pcdac (I inc by 10)                              |
|   j - Decrease pcdac (J dec by 10)                              |
|   f - Increase power output by 0.5dBm (F inc by 5dBm)           |
|   c - Decrease power output by 0.5dBm (C dec by 5dBm)           |
|   u - Increase ob by 1 (w - increase b-ob)                      |
|   h - Increase db by 1 (q - increase b-db)                      |
|   v - Toggle power override (ovr)                               |
|   x - Toggle external power                                     |
|   y - Increase gainI by 1 (Y inc by 10)                         |
|   g - decrease gainI by 1 (G dec by 10)                         |
|   m - Increase rf Gain Boost                                    |
|   n - Step xpd gain by 6dB                                      |
|   b - Toggle turbo mode                                         |
|   a - Toggle antenna                                            |
|   1 - Toggle unicast/broadcast packets                          |
|   9 - Toggle dynamic optimization                               |
|   4 - Increment Fixed gain                                      |
| ESC - exit                                                      |
===================================================================
```

Menu items in red are not always available. If power override is off, the ability to toggle external power is available, but not the ability to adjust gainI. If power override is on, the ability to change gainI is available, but no external power control. The ability to increment the fixed gain is only available when dynamic optimization is inactive

NOTE: For the slower rates it is recommended to set the number of packets to 5000 in order that the test complete in a reasonable amount of time.

EEPROM Function (p)

This option allows the EEPROM contents to be backed up to file, read from a file, erased, or displayed as either a byte stream or formatted information. An EAR file can be loaded into EEPROM, or an existing one read and displayed. Press ESC to return to the main Test Options menu when finished.

Version 4.4 of ART now supports EEPROM version 4.4. Older versions of the EEPROM will be supported by this menu of ART

```
===========================================================
| EEPROM                                                  |
|   P -  Blank EEPROM (P)rogramming mode                  |
|   B - (B)ack up EEPROM content to file                  |
|   R - (R)estore EEPROM content from file                |
|   E - (E)rase EEPROM content                            |
|   S - Re-calculate check(S)um for calibration date      |
|   C - Display (C)alibration data                        |
|   D - (D)isplay EEPROM content on the screen            |
|   W - (W)rite single EEPROM location                    |
|   G - (G)et (read) single EEPROM location               |
|   L - (L)oad EAR into EEPROM                            |
|   A - Display E(A)R contents in EEPROM                   |
| ESC - exit                                              |
===========================================================
```

NOTE: The Blank EEPROM programming mode (P) will program EEPROM locations 0 through 0xBE using the values held in **atheros-eep.txt** and the subsystem ID specified in **artsetup.txt**. The same functionality would be accomplished by the \prog ART command line option.

NOTE: In order to load an EAR file into EEPROM, the adapter must have been calibrated in order to setup the EEPROM location that specifies the start of the EAR.

Switch Test Card (s)

This option allows a card to be removed and a new one inserted. On re-insertion, ART will search for the new card and program it with the last set of register values held for the card that was removed.

Manufacturing Test & Calibration (m)

The manufacturing and calibration tests provide options for performing card calibration and demonstrate a sample manufacturing and test process.

NOTE: It is strongly recommended that the contents of EEPROM be backed up before any execution of the test program. In order for the test program to produce accurate results, the entire test setup (instruments and cable) must be calibrated and the appropriate loss figures must be entered.

The test consists of using a golden, known good, system as a reference (the golden system test should be started first), against the device to be tested. The tests that will be run between the DUT and golden system is configurable, and an option is provided to view which configurations are enabled. Press ESC to return to the main menu when finished.

```
===============================================
| Manufacturing Test & Calibration Options: |
|    d - (D)evice Under Test Begin          |
|    g - (G)olden Unit Test Begin           |
|    q - (Q)uit                             |
===============================================
```

Note that ART supports reading older versions of EEPROM, however the calibration of cards to specific EEPROM versions is only supported by specific versions of ART as shown by Table 1-1 on page 1-2.

For a full description of the testing performed refer to the *AR5001/AR5002 Sample Manufacturing Test Flow.*

Enable Logging (g)

Enable logging will cause all information printed on screen, with the exception of the menus, to all be logged to a file. If no log file has been specified in **artsetup.txt**, the system prompts for a filename for logging, otherwise the filename set by LOG_FILE will be used. If the file already exists, then new information is appended at the end of the existing file. This is a toggle menu, if logging is already enabled, then selecting 'g' from the menu will disable it. Logging will be on by default if the flag LOGGING is set in **artsetup.txt**.

Utility Menu (u)

This menu provides some miscellaneous utilities to the user. These include the ability to read and write single registers, write register fields, the ability to tune to a new channel (useful when a large channel jump is required), display a noise-floor histogram of channel noise and put the adapter into sleep mode.

```
=================================================================
| Utility Menu                                                  |
|    r - Read a register offset                                 |
|    w - Write to a register offset                             |
|    p - (P)ut/write a field                                    |
|    c = (C)hange current channel value                         |
|    n = (N)oise floor histogram                                |
|    s = (S)leep mode toggle                                    |
| ESC - exit                                                    |
=================================================================
```

3

ART Extensions For Command Line Testing

This chapter describes the extensions that have been added to enable tests to be run from the command line.

Additional Commands

Starting with ART version 2.5, new tests have been added that can be run from the command line, and as a result can be incorporated into scripts for batch runs. The following additional command line options are supported:

```
C:\art> art \golden \txtest \rxtest \beacon=NN-NN-NN-NN-NN-NN
\tptestup \tptestdown \macaddr \ch=NNNNx,NNNNx \ant=a|b|m
\goldant=a|b|m \iterations=N \log
```

Five test types are supported: txtest, rxtest, tptest (up and down), macaddr and beacon test. One, some, or all of these tests can be specified on the command line. They will be run one after the other. The order of the tests is fixed and, as a result, changing the order of the tests on the command line will not change the order in which the tests are run. Table 3-1 describes each of the command line options in more detail.

Table 3-1. **Additional Command Line Options**

Option	Description
\golden	Make this station the golden unit for the transmit and receive link tests. Other command line options are ignored when in golden mode. When in this mode, the golden unit sits in an infinite loop, waiting for connection from a DUT.
\txtest	Perform a transmit link test, where this station (DUT) will be the transmitter, and another station running in golden mode will be the receiver. The DUT will display the test statistics accumulated by the golden receiver.
\rxtest	Perform a receive link test, where this station (DUT) will be the receiver, and another station running in golden mode will be the transmitter. The DUT will display the test statistics of the packets it receives.
\beacon=NN-NN-NN-NN-NN-NN	Receive the number of beacons specified by NUM_PACKETS in **arttest.txt** for the specified BSSID. NN-NN-NN-NN-NN-NN is the BSSID (MACID) for which to collect beacons, and should be specified in the dash notation shown. Only beacons from this BSSID will be counted.
\tptestup	Perform an uplink throughput test where this station (DUT) will be the transmitter, and another station running on golden mode will be the receiver. Throughput is calculated on the transmit side, by sending unicast packets and waiting for ACKs.
\tptestdown	Perform a downlink throughput test where the station running in golden mode will be the transmitter and this station (DUT) will be the receiver. Throughput is calculated on the transmit side, by sending unicast packets and waiting for ACK's.
\macaddr	Will perform a simple test on this station's wireless MAC address. This test verifies that the MAC address is within the range specified in arttest.txt by the MAC_ADDRESS_MIN and MAC_ADDRESS_MAX parameters.

Table 3-1. **Additional Command Line Options**

Option	Description
\ch=NNNNx,NNNNx...	Specify a list of channels and modes for which to perform the command line tests. NNNN is the channel value in MHz and x is the mode: a = 11a, b = 11b, g = 11g, o = ofdm@2.4, t = 11a turbo, u = 11g turbo. Any number of channels (including modes) can be specified. Each of the tests on the command line will be performed at each channel in the channel list.
\ant=a|b|m	Specify which antenna on the DUT to perform the tests at. Valid selections are antenna A (a), antenna B (b), or both A and B (m). If 'm' is selected, then each test will be performed on each antenna at each of the channels listed.
\goldant=a|b|m	Specify which antenna on the golden station to perform the test at. Valid selections are antenna A (a), antenna B (b), or both A and B (m).
\log=logfilename	Enable logging of screen display to file also. Logfilename is the name of the file to log to.
\iterations=N	This overrides the NUM_ITERATIONS specified in arttest.txt. It is the number of times to perform each test. N is the number of iterations

Examples

The command line:

```
C:\art> art \txtest \rxtest \ch=5300a,2412b \ant=m \iterations=10
```
performs the transmit and receive test at channel 5300 in 11a mode and at 2412 in 11b mode. Each test and each channel will be run first on antenna A then on antenna B. Each transmit test and receive test will be run for 10 iterations.

The command:

```
C:\art> art \golden
```
causes this station to enter golden station mode, where it will wait on a DUT to initiate a tx or rx test. It is not necessary to list any channels for the golden station since at the start of each test, the DUT will send the channel and test information to the golden unit.

The command:

```
C:\art> art \beacon=00-12-23-ab-cd-ef \ch=5280a
```
causes the station to listen on channel 5280 in mode 11a, for beacons with the BSSID of 00-12-34-ab-cd-ef.

The command:

```
c:\art> art \tptestup \tptestdown \ch=5360a,2412g \ant=m \goldant=m
```
performs the throughput uplink and downlink at channel 5360 in mode 11a and 2412 in mode 11g. Each test and each channel will be performed on each of the DUT and golden antenna combinations.

Test Configurations

The tests described in the previous section are configured through parameters specified in the file **arttest.txt**. This file controls parameters for how the tests should be run and the criteria that must be met for the tests to pass. Table 3-2 describes these parameters.

Table 3-2. **ARTTEST.TXT Parameter Descriptions**

Parameter	Description
NUM_ITERATIONS	Specifies how many iterations of the test should be run.
NUM_PACKETS	For the beacon test, this specifies how many beacons should be received. For the transmit and link tests, this specifies how many packets per rate should be transmitted. Valid values are in the range 1 to 100.

Table 3-2. **ARTTEST.TXT Parameter Descriptions (continued)**

Parameter	Description
PACKET_SIZE	Specifies the size of each packet transmitted in the link tests. This parameter is ignored for the beacon test.
TP_PACKET_SIZE	Specifies the size of packet to use for the throughput test
TP_RATE_MASK	Specify which rates to perform the throughput test for. The rate mask is the same format as RATE_MASK in artsetup.txt.
BEACON_TIMEOUT	Time in milliseconds for how long the beacon test should wait to receive the expected number of beacons.
TP_NUM_PACKETS	Specifies how many packets should be sent in the throughput test.
TP_CCK_NUM_PACKETS	Specify the number of CCK packets to send during the throughput menu. For speed reasons, it is sometimes a good idea to make this less that TP_NUM_PACKETS.
5G_SIDE_CHANNEL	Which frequency (in MHz) should be used for DUT to golden test synchronization packets for 802.11a tests.
2G_SIDE_CHANNEL	Which frequency (in MHz) should be used for DUT to golden test synchronization packets for 802.11b tests.
MAC_ADDRESS_MIN	Minimum MAC address of the range used by the MAC address test. This should be specified in the format NN-NN-NN-NN-NN-NN.
MAC_ADDRESS_MAX	Maximum MAC address of the range used by the MAC address test. This should be specified in the format NN-NN-NN-NN-NN-NN.
PER_THRESHOLD	Specifies how many good packets, per rate, should be received in the link tests for the test to pass. This parameter is ignored for the beacon test.
TP_THRESHOLD_11A	Specifies how many good OFDM packets, per rate should be received in the throughput tests for the test to pass.
TP_THRESHOLD_11B	Specifies how many good CCK packets, per rate should be received in the throughput tests for the test to pass.
PPM_MIN	This is the minimum acceptable PPM value, per iteration, for the test to pass. This value is only used in the link tests. It is ignored for the beacon test.
PPM_MAX	This is the maximum acceptable PPM value, per iteration, for the test to pass. This value is only used in the link tests. It is ignored for the beacon test.
RSSI_THRESHOLD_11a_antA	This is the minimum allowable RSSI value for 802.11a on antenna A.

Table 3-2. **ARTTEST.TXT Parameter Descriptions (continued)**

Parameter	Description
RSSI_THRESHOLD_11b_antA	This is the minimum allowable RSSI value for 802.11b on antenna A.
RSSI_THRESHOLD_11g_antA	This is the minimum allowable RSSI value for 802.11g on antenna A.
RSSI_THRESHOLD_11a_antB	This is the minimum allowable RSSI value for 802.11a on antenna B.
RSSI_THRESHOLD_11b_antB	This is the minimum allowable RSSI value for 802.11b on antenna B.
RSSI_THRESHOLD_11g_antB	This is the minimum allowable RSSI value for 802.11g on antenna B.
CRC_THRESHOLD	Specifies the maximum number of packets with CRC errors, per iteration, that can be received for the test to pass. This value is only used in the link tests. It is ignored for the beacon test.
BEACON_TIMEOUT	This value specifies how long (in milliseconds) the beacon test should wait to receive the required number of beacons before timing out in error. A reasonable timeout value should be calculated based on the number of beacons expected and the beacon interval for the BSS. This value is only used in the beacon tests and is ignored for the link test.

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